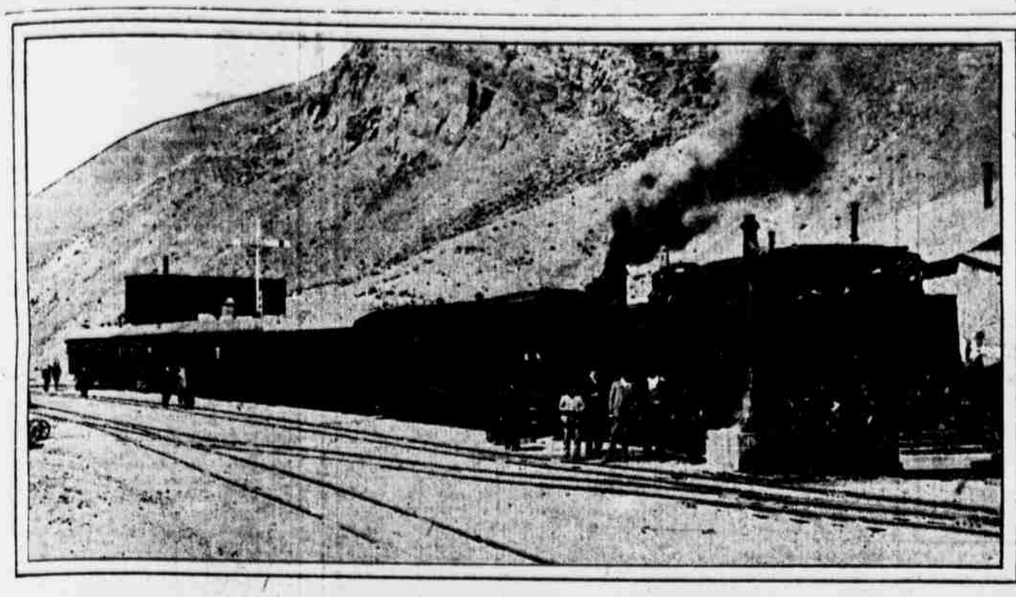
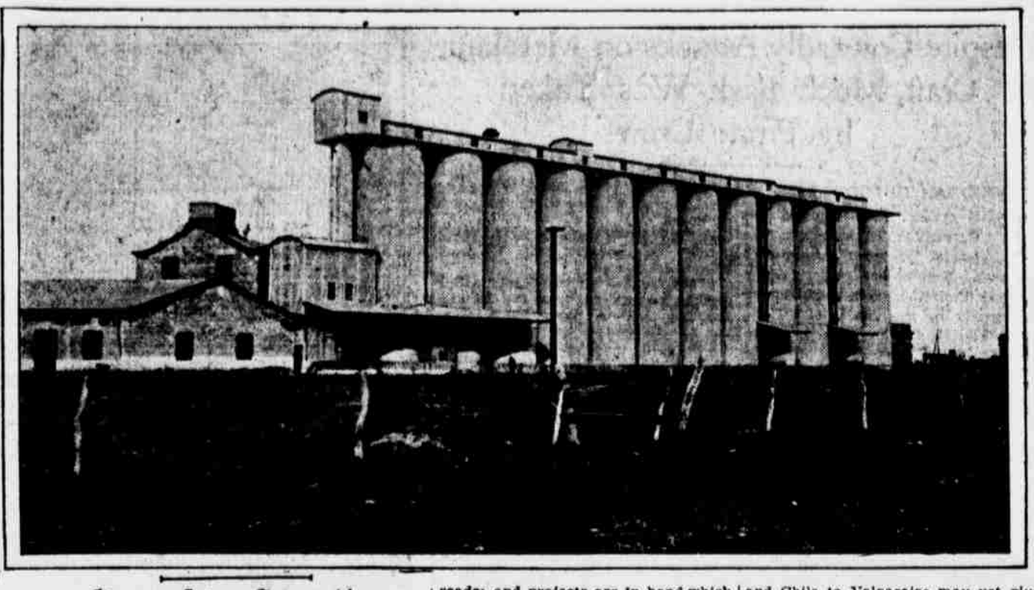
Few Links Needed for the 10,000 Mile Pan-American Railway



End of Isolation of Southern Hemisphere Seen When System Is Complete and Transit Time Cut in Half—Immense Social and Business Gains Bound to Follow—Yankee Engineers, Materials and Capital Dominant Factors in the Building



Storage bins for grain, Province of Entre Rios.

By ROBERT G. SKERRETT.

THE Pan-American Railroad is no longer a mere potentiality; it is all but a fact. Unless the signs mislead it won't be a great while now before we can travel entirely by rail from New York to Buenos Ayres, about 10,000 miles. Railroad builders have been decidedly busy in South America during the last few years, and month by month they have been expanding the steel grid which is steadily unifying the rapid transit of our neighbor continent.

Kindred activities have been under way or are about to begin through parts of Central America, and Mexico is doing her share to amplify railroad facilities between the United States and the southern hemisphere. The problem is not so much to run new long stretches of rails as it is to create comparatively short sections which shall connect in one enormous system the railroads of all three Americas. At present, by the best steamers, it takes twenty-five days to make the run from New York to Buenos Ayres. By rail it is promised that the distance can be covered in fifteen.

Intercommunication of this sort must increase tremendously the tide of social and business intercourse between North and South America and at the same time add proportionately to the volume of our trade exchanges. Politically it must prove of the utmost importance, for it would do away in very large measure with the isolation which has heretofore existed in the main because of our geographical separation and the fact that water routes alone made it possible for us to reach one another.

Six years ago Theodore Roosevelt said in Rio de Janeiro:

"The relations of the northern and southern continents of the western hemisphere are certain to become much closer in the future through the Panama Canal and otherwise. I believe that as the nineteenth was the century of North America, so will the twentieth be the century of South America."

U. S. Playing a Great Part.

Certain it is that in the last four years our trade relations with Latin America have developed to an astonishing degree; and it is equally true that American capital and engineering enterprise are playing a conspicuous part in the expansion of the railways both in Central and South America. Our Latin neighbors have learned to know us better and are far more eager for our wares than heretofore. In every direction where time counts it is plain that all of us in this hemisphere have much to gain by promoting rapid intercommunication.

The Pan-American railway, then, is something that profoundly concerns the people of the United States; and our present and prospective economic problems add just so much weight to the arguments heretofore made in advocating this traffic bond between the continents. Finally there is the military aspect of the subject. One does not have to be an expert to realize the strategic gain to the common defence from an all land route by which troops of either continent could be rapidly moved north or south.

Broadly, the line to be followed by the Pan-American railway will be any of the existing United States railroad routes down to the Mexican border; these routes, as is well known, reach from the Canadian boundary and cover our country from east to west. From Mexico the Pan-American system will run into Central America, cross the Isthmus of Panama, spanning the canal and then enter South America at the Colombian frontier. The scheme is to traverse the highlands of Colombia, Ecuador, Peru and Bolivia, descending in Bolivia to the Argentine border, and continuing from there on to Buenos Ayres and the eastern coast of South America.

At the present time there is considerable construction yet to be done through the mountains of Ecuador and Colombia, and there remain a number of connecting links to be built in Central America. Even so, work on any of these can be pushed much faster than was possible a few years back, simply because we have newer and more efficient technical means at our disposal, and our constructors are wiser and more capable, owing to their recent emergency experience.

Building and extending railroads in South America are not novel problems for our railroad engineers. Some of the finest and most spectacular work of the kind done on that continent has been done by Americans. That we have not stood out conspicuously, so far as publicity is concerned, has been due to the fact that European capital has pretty generally predominated. In other words, we have contributed the engineering skill, but European bondholders have had the glory. We have much to gain by fostering the expansion of South American railroads and especially in funding the completion of the Pan-American system. There may be no sentiment in business, but there is cordial interest where dollars and benefits are of mutual concern.

We have been accustomed for years to judge our national prosperity by the status of the steel industry. Steel of all sorts is needed in the construction and equipping of railroads. The railroads of South and Central America, built, building and projected, offer us opportunities to furnish immense quantities of structural materials, machinery and rolling stock. The field now open to us is infinitely wider than it has ever been before, and this principally because reconstruction in Europe is going to give our commercial rivals across the Atlantic so much to do at home that their steel mills, &c., will be kept busy on immediate domestic needs. Further, if we are wise and make the most of our shipping, it will be practicable for us to deliver railroad materials in South and Central America quicker and cheaper than our European competitors.

As has already been outlined, most of the new work that will have to be done to complete the Pan-American system will be in Central America and along the western mountains of South America. We shall be able to reach those regions by way of the Gulf of Mexico, the Caribbean Sea and the Panama Canal. This water route is a good deal shorter than the transatlantic runs to the same objectives, and this advantage should be made to count in our favor and to increase the likelihood of American steel mills, locomotive works, car building works, &c., getting the cream of this business.

And now let us see what is being done toward the consummation of the Pan-American Railway project. A few weeks ago it was reported that construction work would be started very shortly on a railway connecting Merida, capital of Yucatan, with Mexico city. The road is to run through the southern part of Yucatan, traverse the States of Campeche and Tabasco, and then effect junction with the Pan-American route at Santa Lucrecia in the State of Vera Cruz. From Santa Lucrecia an existing line runs south to the Pacific coast of Mexico and thence down into Guatemala, where it joins a line controlled by American fruit interests.

The latter runs generally parallel with the Guatemalan coast, but stops some little distance from the Guatemala-Salvador boundary. There are two short lines in Salvador, but they are not joined; therefore the country cannot yet be spanned east to west by rail. From San Miguel, Salvador, to Corinto, Nicaragua, there is another gap, but from Corinto to Lake Nicaragua there is a railway. From that point on to the Panama Canal practically nothing has yet been built that could be considered a part of the proposed Pan-American system.

Surveys have been made, however, to cover this section, and plans are already drawn up for the extension south from the Canal into Colombia and thence along the western side of South America down to the northern limits of the growing systems of steam transportation in Ecuador and Peru. To-day Ecuador is not traversed north and south for more than half its breadth by rail, and railway building has not as yet made notable progress there except in the Guayaquil-Quito road, which was finished in 1908. The construction, materials and operation being American. This line has a total length of 285 miles, and in reaching Quito climbs to a height of 11,841 feet.

Railroading in Peru may be counted on to thrill the most phlegmatic. The physical character of the country, with its high mountain system parallel to the coast along its entire length, has made railway construction both costly and extremely difficult in many instances. Most of the lines are short, running from the coast to the Andes or for moderate distances north and south, but in two notable cases the mountains have been climbed and connections made with the interior plateau lying between the east and west ranges of the Andes. These exceptions are the Peruvian Central Railway and the Southern Railway of Peru, and Americans may rightly be proud of such engineering accomplishments.

The Peruvian Central Railway, which has the distinction of being the highest and most remarkable line in the world, was partly constructed forty odd years ago by Henry Meiggs, an American. The main line extends from Callao, on the coast, up to Lima and thence to Oroya, branching north from there to Cerro de Pasco and also swinging south for a longer run to Huancayo. The Callao-Oroya section in the rather short distance of 106 miles reaches the great altitude of 15,665 feet at Galera Tunnel, cut right through the continental divide. A branch ten miles long extends from Ticlio to the mines at Morococha, this spur attaining an altitude of 15,865 feet above sea level, the highest point yet climbed by any railroad in existence.

One Here Has 65 Tunnels.

On the Peruvian Central line are sixty-five tunnels and [illegible]-seven bridges, many of which are marvels of construction. The longest of the bridges has a span of 575 feet, and crosses a ravine 300 feet above its bottom. Nearly all the rolling stock is American. The locomotives burn oil, the product of Peruvian wells.

A line of almost equal importance is that from Mollendo to Puno, on Lake Titicaca, which connects with steamships there and carries a large share of Bolivia's commerce to and from the Pacific coast. This is the Southern Railway, also the product of the genius of Henry Meiggs, who planned it and constructed part of it. It was completed by Henry Thorndyke, another American. The Southern, after fifteen miles along the seashore on flat coastal country, begins its tremendous climb. At a distance of 107 miles from Mollendo, Arequipa is reached at an altitude of 7,550 feet. Crucero Alto, the highest point along the route (14,688 feet), is 117 miles beyond Arequipa, and thence the line descends gradually to Puno, 12,535 feet.

The total distance from Mollendo to Puno is 326 miles. At the southern end of Lake Titicaca is Guaqui, which is connected by rail with La Paz, the northwest terminal of the line running southward through Bolivia into the Argentine.

The Department of Fomento, that branch of the Peruvian Government which has supervision over all public works, is actively engaged in the study and advancement of several railway projects which are to connect the mineral region of the Peruvian Andes with both the coast and the rich agricultural country which extends over the eastern slope of the Andes from an altitude of 10,000 feet and down into a vast prairie, where climate and soil are ideal for the raising of cattle and the growing of wheat and barley. This is the proposed longitudinal railway for northern Peru.

In studies made years ago for the line of the Pan-American Railway it was found that the international steam road would enter Bolivia over the route of the present La Quiaca-Tupiza route, would follow the Southern Railway of Peru from the shores of Titicaca to a point between Juliaca and Cuzco, and from there would run through a rough but fertile country to Ayacucho and on to Huancayo. Here it would be linked with the Central Railway of Peru and the road of the Cerro de Pasco Copper Corporation, reaching the coast at Callao; or proceeding northward over the Central Andean region of lakes and mountains (a highly mineralized area) and through the lower valleys in the Callejon de Huaylas to the historic Inca capital of Cajamarca, reaching the seaboard by a short spur at the Bay of Chimbote.

At present Peru is engaged in the extension of the Central Railway beyond Cuzco in the direction of Ayacucho. With the completion of this branch and joining the line up with Huancayo, an important link in the ultimate Pan-American railway will be ready. And now with the actual and potential sections of the intercontinental route described from Panama down to La Paz, let us trace existing rail connections on through Bolivia to the northern frontier of Argentina, and thence down to Buenos Ayres. To-day there is a direct run from La Paz to Tupiza, and from there south to La Quiaca, just over the Argentine boundary. At that point one of the Argentine railways runs south and east right on to Buenos Ayres.

Because of her landlocked position, Bolivia has been wise enough to foster the development of her railway systems, and she now has 900 miles of well managed and well equipped roads; and projects are in hand which in the course of the next few years will add some hundreds of miles more. One of the schemes is to extend the Potosi-Sucre road from Sucre, which is the capital of Bolivia, on to Puerto Suarez on the Paraguay River and directly opposite Corumba, Brazil, to which port the Brazilian Government is building a railroad. The length of the Sucre-Puerto Suarez run is between 425 and 450 miles. The route has been in the main surveyed and it is estimated that construction will cost a little over $10,000,000.

New Transcontinental Route.

With the completion of these proposed lines, there will be provided a through transcontinental route from the Pacific coast either at Mollendo, Peru, or Antofagasta, Chile, to Rio de Janeiro. The rail distance will be approximately 1,900 miles. To-day Rio can reach the Pacific coast by rail only by running south and connecting with certain of the Argentine lines.

In Chile the backbone of the whole steam traffic system is the longitudinal railway, which when completed will run for nearly the whole length of the country, 2,200 miles from Arica on the north to Puerto Monti on the south. At the present time there is a break in this system between Pisagua and Chaca, just south of Arica. One of the most prominent lines is the Antofagasta and Bolivia railway which runs between La Pez and the Pacific coast and covers a distance of 718 miles. This road is one of the best managed and most profitable in South America. The up run from Antofagasta to La Paz takes forty-three hours; the down trip is three hours shorter. La Paz is also linked with the seacoast by the comparatively short run of 281 miles to the port of Arica.

Probably the most interesting of the transcontinental lines of South America is that running from Valparaiso, Chile, up through the Andes, then down into Argentina and on to Buenos Aires. The mountain section of this railway climbs to an altitude of 10,600 feet above sea level, and numerous tunnels through parts of the mountains make it possible to pass the Andes in winter. It is not unlikely that a coastal railroad running generally parallel with the western shore of South America down through Peru and Chile to Valparaiso may yet give us a through rail run from the Panama Canal to Buenos Ayres.

Heretofore railroading in South America has been greatly hampered by lack of coal, most of this fuel being imported and costing from $10 to $12 a ton delivered. But now both anthracite and bituminous coal have been discovered in South America, and some of these deposits, which are extensive, have been somewhat worked. Coal has been found in Colombia, Ecuador, Peru and Chile, and further utilization depends principally upon the development of railroads to make the fuel more accessible. Both in Chile and Peru oil is burned for steam raising purposes, and Peru can boast of four oil fields which yield petroleum of excellent quality; no inconsiderable quantity being exported to California.

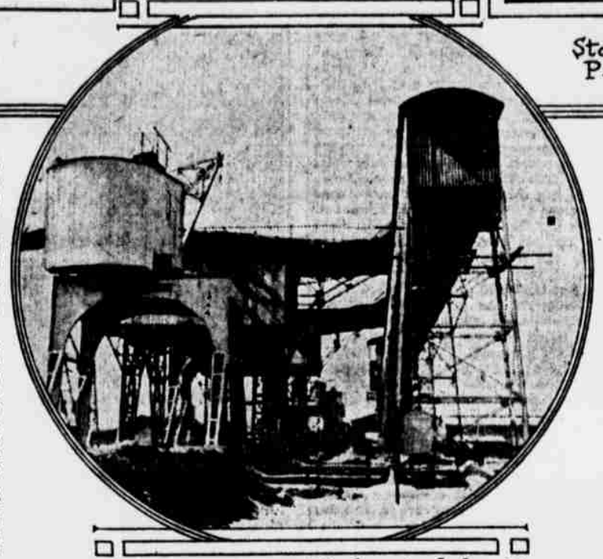
Unlike general conditions among our railroads, which have a standard gauge, the lines in South America vary materially in this respect. Even in the Argentine, probably the most progressive of the South American republics, there are three gauges, broad, medium and narrow. This means that at every point where lines of dissimilar gauges are joined in the Pan-American route travellers will have to change cars and freight must be discharged and reloaded. Not only that, but it is not practicable for the narrow gauge engines to make the speeds that are possible on broad gauge roads. In fact the Government regulations specify that the speed of passenger service on the broad and medium gauge lines shall not exceed 43.4 miles an hour, and on the narrow gauge roads the maximum velocity is 31 miles an hour. The Central Argentine Railway runs a train of all Pullman cars daily between Buenos Ayres and Rosario, 180 miles away, in 4 hours 55 minutes.

Wide Opportunity in Brazil.

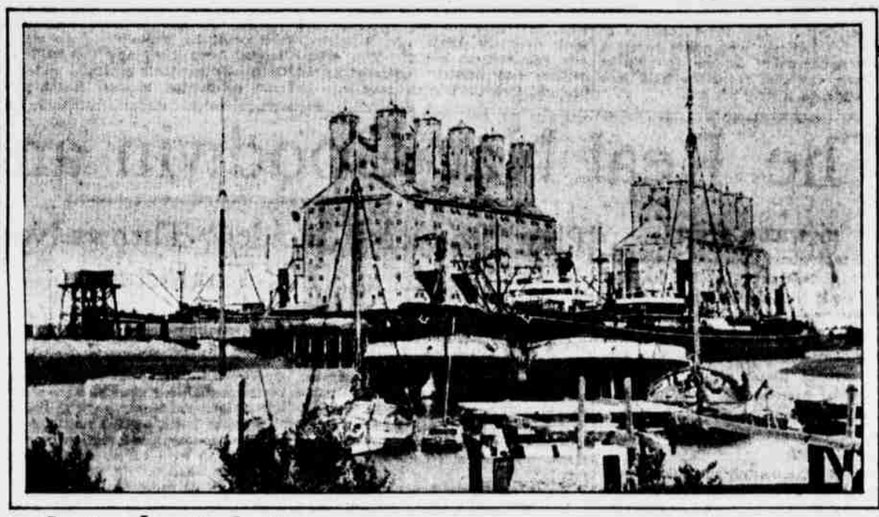
As a field for development Brazil offers wonderful opportunities. In fact Brazil's future is very much bound up with her railroad expansion. With an area of over 8,000,000 square kilometres, or more than 45 per cent. of the total area of South America, Brazil now has less than 16,700 miles of railways in operation. With a territory and a population nearly three times as great as those of the Argentine, Brazil has only about three-fourths of the railroad mileage of the former. The present populated district of Brazil is scarcely more than a mere fringe extending from one end of the long seaboard to the other, but the distribution of her people is slowly widening as the development of the country penetrates beyond the mountain barrier further and further toward the interiors of the more productive of her coastal States. Extension of her railroads is imperative if Brazil is to make the most of her natural riches. Heretofore she has been a good market for American railway supplies and has been commonly found kindly disposed toward American goods.

In the field of electrical supplies South America offers us a splendid opening, particularly so in those regions where mountain streams lend themselves to hydro-electric developments. Indeed, South America will soon be fully aroused to the desirability of making the most of her abundant water power resources, this quite apart from her wealth of fuel now awaiting exploitation; and what our great electrical concerns have done should make it all the easier for them to obtain profitable recognition there. Already some of the South American railroads have electric traction, and it is only a matter of a comparatively short time before this will be largely amplified.

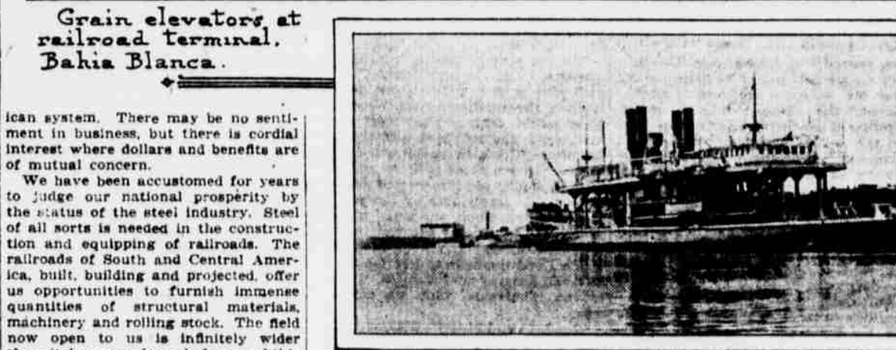
Surely the Pan-American Railway is no longer to be looked upon as a dream, one to be given substance only in the distant future. It is a project that very much concerns the present, and it lies with us to make it a reality within the next few years. The longer we delay the harder it will be for us to share in the undertaking. French, English, German, and Belgian capital have extensively dominated heretofore in South American railroad holdings. We have our chance now to alter the balance in our favor.



International Train from Buenos Aires to Santiago on the Trans Andean R. R.

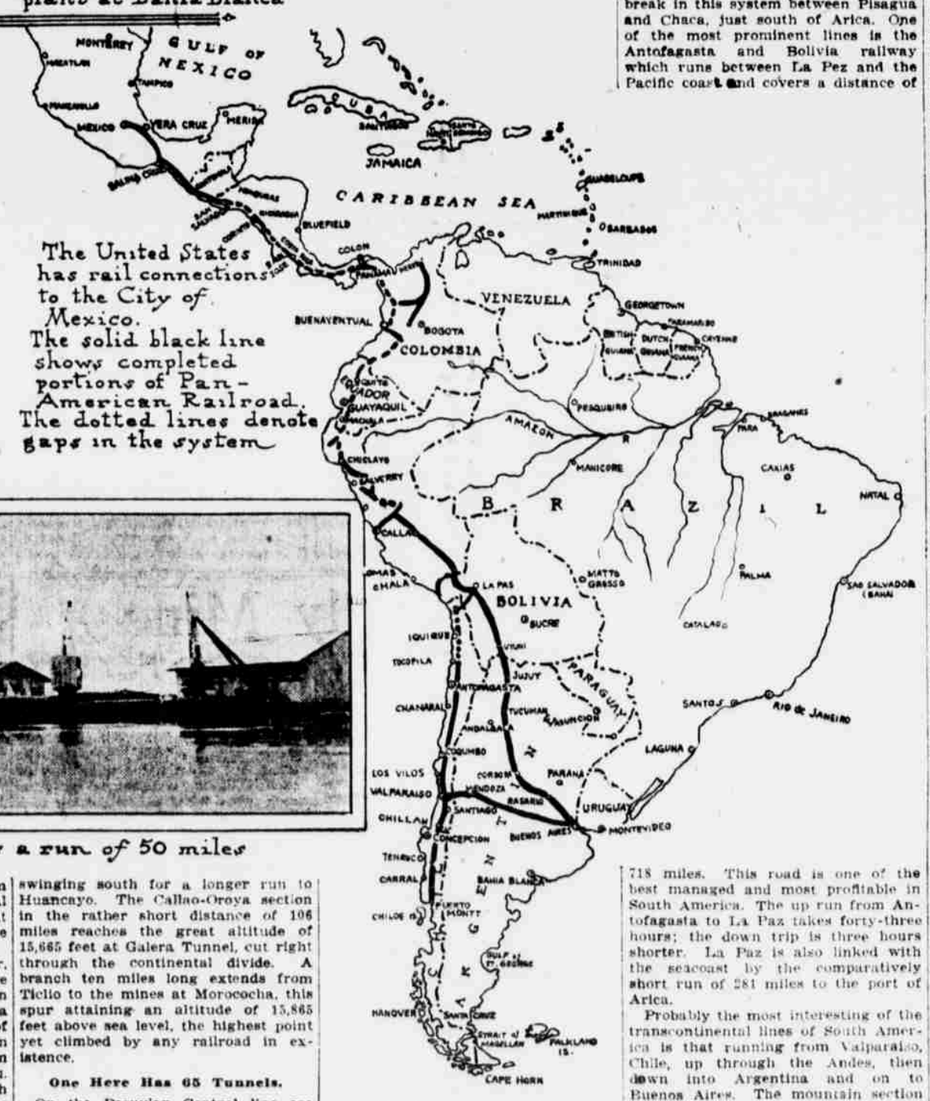


Mechanical loading plant at Bahia Blanca



Grain elevators at railroad terminal, Bahia Blanca.

Car Ferry, Entre Rios Railway. It makes a run of 50 miles



Marine Camouflage Passing Fast

THE great transatlantic liners which survived the long and disastrous U-boat warfare are now coming into port minus the fantastic dazzle paint used to deceive the German undersea raiders. The French liner, Lorraine, on a recent trip, was the first to arrive without it. As she steamed up the bay, with her funnels painted the oldtime red, with deckhouses white and hull black, it seemed to seafaring men that the war must indeed be over.

The French liners and the White Star and Cunard boats were among the last to be taken in hand by the camouflage artists. Long after the Arabic was sunk the big White Star boats were kept in their usual paint, with no attempt at disguise. And not until unrestricted submarine war was declared did the American liners take advantage of gray paint, and then of their first camouflage, which consisted of pink dabs on a field of light gray, a sight, indeed, from waterline to masthead.

During the last eighteen months of the war virtually all vessels of the belligerent nations, even down to the small coastwise boats, were wearing camouflage, which in many instances had proved effective. Under certain conditions of light it was very deceptive. Also, if the U-boat was running submerged, with an officer watching through the periscope, the prismatic effect of the coloring often deceived the raider and interfered with the aiming of a torpedo. (With water or spray on the lens camouflage was doubly valuable.

There was no camouflage which was wholly effective or made ships invisible in good weather conditions. The chances were always in favor of the U-boat discovering the presence of a liner within a reasonable distance.

There was no disguising the thudding of the propellers which could be heard for miles by the U-boat's microphone. And a coal burning vessel, as most of the big ships are, was at a double disadvantage. The long black telltale plume must go up at intervals and it could be seen a great distance on a clear day.

"Oil is the best camouflage," remarked a British sea Captain. He meant that oil burning vessels were not betrayed by smoke.

The first case of camouflage seen in this port after the outbreak of the great war was that of the Cunard liner Laconia, sunk long afterward off the south coast of Ireland by a German torpedo. But hers was camouflage of a special kind. In August, 1914, the Laconia brought nearly 1,600 American refugees from Liverpool to New York.

After leaving port westbound, Capt. Irvine, her commander, gave orders to disguise the ship so that she would not be recognizable to the German surface raiders then at large. The Laconia was repainted at sea, and when she arrived here was to all intents and purposes a duplicate of the Scandinavian-American liner Frederik VIII. The lower parts of her funnels had been painted black, leaving a red band. Her superstructure was coated with brown.

U-boat operations had not been begun at that time. It was not until October of that year that the outward bound African liner Falaba was sunk with large loss of life. This was the first of the long list of outrages on passenger vessels.

Five Known Kinds of Ice

THERE are, it appears, no fewer than five distinct kinds of ice.

First there is the common ice, which is water frozen at ordinary atmospheric pressure. This is called Ice I. It is from 10 to 13.5 per cent. less dense than water.

If this is placed under a pressure of about 1,000 kilograms the ice melts to water. If the pressure is increased to about 4,400 kilograms the liquid water freezes again to another kind of ice called Ice V., which is about 6 per cent. denser than water.

Increasing the pressure to about 6,500 kilograms we get Ice IV, the volumic pressure and the density becoming from 5 to 9 per cent. greater than water.

If we freeze water at atmospheric pressure, but with a temperature of —30 degrees C., ordinary ice (Ice I) is changed into Ice III, which is on the average 3 per cent. denser than water and 20 per cent. denser than Ice I.

Further increasing the pressure, Ice III turns into Ice II, which is about 22 per cent. denser than Ice. I. On further increasing the pressure Ice II changes to Ice V and then to Ice IV.

Sometimes these changes take place so quickly that a click is heard. The lower the temperature the more slowly is the change effected.

This discovery has a practical application. When water freezes in a closed vessel immense pressure is developed. The bursting of boilers and water pipes is a familiar example of this. The water expands in freezing to Ice II, but if the pressure on the ice during freezing exceeds about 2,000 kilograms, corresponding to 30,000 pounds per square inch, Ice III is formed. As this is about 3 per cent. denser than water and has less volume, it shrinks rather than expands.